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AROIDS FROM THE WULIANGSHAN MOUNTAINS

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Abstract There are 20 species in seven genera of aroids in Wuliangshan Mountains. They distribute in different areas according to their own ecological habits. The genera can be divided into four areal - types, which can indicate the floristical relationships between the target area and its concerned regions. The geographical affinity of species is also preliminary discussed.

Key words Wuliangshan Mountains, aroids, geographical distribution.

The Wuliangshan Mountains, or Wuliang Shan Range, one of the key protected areas in China, occupies an area of about 2800 km^2, from ca. 24°0′ to 24°45′ N and from ca. 100°25′to 100°53′ E. It is located in the south - central part of Yunnan Province. The area is deeply cut on the east and the west sides by Babian River (upper stream of Black River) and Mekong River, resulting in a steep topography. The highest peak is about 3373 m above sea level, and most of the land varies from 1900 to 2400 meters. The vertical climate were classified as southern subtropical, middle to northern subtropical, warm, and temperate zones.

Six major soil types have been described in this region: (1) laterizatic - red soil, below 1450 m above sea level; (2) yellow - red soil, (1400) 1500 - 2000 m; (3) yellow - brown soil, (2000) 2200 - 2900 (3000) m; (4) brown soil, 2700 - 3000 m; (5) subalpine meadow soil, above 3000 m; and (6) limestone soil, from 1300 to 2500 m.

VEGETATION COMPOSITION

There are five major forest zones from the base to the crest of the Wuliangshan Mountains: (1) *Pinus kesiya* var. *langbianensis* forest (or monsoon evergreen broadleaf forest dominated by *Castanopsis fleuryi* and *Lithocarpus truncatus*) zone, below 1750 m; (2) *Pinus yunnanensis* forest (or semi - humid evergreen broadleaf forest dominated by *Castanopsis orthacanthus* and *Schima argentea*) zone, (1700) 1800 - 2200 (2500) m; (3) montane humid evergreen broad - leaved forest zone, 2200 (2500) - 2700 (2950) m, of which the dominant species are *Lithocarpus echinophorus*, *Schima argentea* in the lower part, and *Castanopsis wattii* and *Lithocarpus xylocarpus* in the upper part; (4) elfin forest (or dwarf cloud forest), (2700) 2800 - 3000 m, which is dominated by *Rhododendron spp.*, *Illicium macranthum*, *Skimma laureola* var. *multinervis* and *Clethra delavayi*; (5) subalpine azalea bush, above 3000 m, dominated by a few species of *Rhododendron* and *Vaccinium*. In addition, from 2600 to 2900 m on the east slope and from 2700 to 2950 m on the west slope there is a characteristic *Tsuga dumosa* coniferous and broad - leaf mixed forest.

AROIDS IN THE REGION

In the Wuliangshan Mountains, the aroid flora comprises 20 species in seven genera. Among them nine species are endemic to China. All of the species found in the region are: (1) *Pothos chinensis* (Raf.) Merr.; (2) *Acorus gramineus* Soland.; (3) *Acrous tatarinowii* Schott; (4) *Rhaphidophora decursiva* (Roxb.) Schott; (5) *Rhaphidophora hookeri* Schott; (6) *Rhaphidophora lancifolia* Schott; (7) *Rhaphidophora luchunensis* H. Li; (8) *Remusatia pumila* (D. Don) H. Li and A. Hay; (9) *Remusatia vivipara* (Lodd.) Schott; (10) *Colocasia esculenta* (L.) Schott var. *antiquorum* Hubb. et Rehder; (11) *Amorphophallus yun-*

nanensis Engl.; (12) *Arisaema* wattii Hook. f..; (13) *Arisaema erubescens* (Wall.) Schott; (14) *Arisaema griffithii* Schott var. *verrucosum* (Schott) Hara; (15) *Arisaema inkiangense* H. Li; (16) *Arisaema jingdongense* H. Peng et H. Li; (17) *Arisaema lobatum* Engl.; (18) *Arisaema tengtsungense* H. Li; (19) *Arisaema wardii* Marq. et Shaw; and (20) *Arisaema yunnanense* Buchet.

GEOGRAPHICAL DISTRIBUTION

Through an analysis of vertical distribution of the aroids in the target area, it is concluded that the climbing or epiphytic aroids are concentrated in the lower region below 2200 m, the upper limit for aroids of this kind is about 2400 m. The terrestrial perennial aroids are distributed in the upper part of the mountain range.

The elevation of 1350 meters is the lower limit for the terrestrial aroids, most of which are concentrated from 1600 to 2400 m, where there are 6 species, over 60% of the terrestrial aroids. *Arisaema griffithii* var. *verrucosum* grows in the elfin forest at 3000 m above sea level. *Arisaema wardii* goes over 3200 m. *Arisaema tengtsungense* was also found in the azalea bush on the top of Mt. Beiwawashan. The discovery undoubtedly supports the recognition of *A. tengtsungense*, which someone considered as an accidental mutant.

RELATIONSHIP OF THE WULIANGSHAN MOUNTAINS AROID FLORA

1. Geographical Affinity of the Genera

Based on the geographical distribution given for each genus in Willis (1973) and data provided by Wu (1991), we were able to classify the six genera into 4 distribution types as follows:

Tropical Asia and Tropical Africa

In fact the category is a subcategory of the Old World tropical pattern in that it includes genera with much the same kind of distribution, but with their centers of concentration in the west and southwest rather than in the east. The eastern extremity of this distribution type extends to Fiji in the South Pacific, but not to Australia. In the Wuliangshan Mountains aroid flora, *Amorphophallus* Bl. ex Decaisne (1/25/100 = the number of species in Wuliangshan Mountains/China/Worldwide, the same below) and *Remusatia* Schott (2/3 - 4/3 - 4) belong to this type. However, they are uncommon in the region. This pattern of distribution can serve as an indication of their Gondwana origin and the role of the Indian landmass in carrying the Gondwana element into tropical Asia.

Tropical Asia

Tropical Asia, the center of Old World tropics, has one of the richest flora in the world. The eastern boundary reaches Fiji or other islands of the South Pacific but never to the continent of Australia. Within this category, there are *Pothos* L. (1/8/75) and *Rhaphidophora* Hassk. (4/9/100), *Colocasia* Schott [(1/8/8 - (13)]. The first one has some members in Madagasgar, the second one reaches New Caledonia. The members of the former two genera are important elements in the monsoon evergreen broad - leaved forest in this region. They show that Wuliangshan Mountains is very closely linked floristically with tropical Asia, which is the place of the origin of some plants from East Asia that prefer warm climate.

North Temperate

All of these widely distributed genera are restricted to the temperate regions of Eurasia and America. There are also a few genera that are equally characteristic of North Temperate and parts of the tropics especially in the more mountainous region of the latter. *Arisaema* Mart. is an example of the type. The genus has nine species in the Wuliangshan Mountains, among them, *A. erubescens* is very common under the forest. Li (1980) believed that Himalaya - Hengduan Mountains is certainly the recent center of speciation of the genus, with 61 species from all the 12 sections. This amounts to 41% of the known species of the genus, 57 endemic species and there are four endemic sections. These range from primitive to the most advanced, in addition to some monotypic sections (e.g. *Dochafa* and *Exappendiculata*). The Wuliangshan Mountains beyond doubt is very close to the center. The fact that this North Temperate genus is thriving in the subtropics seems to be an evidence for the conclusion that North Temperate elements have close affinity to the tropical elements.

Eastern Asia and North America

The disjunction pattern between Asia and North America is perhaps the most important biogeographically for the amount of interest it has generated. Since Gray (1846) first paid special attention to it, it has been much studied and discussed. *Acorus* L. (2/3 - 4/3 - 4) belongs to this famous disjunction pattern, and has two species in the Wuliangshan Mountains.

2. Geographical Affinity of the Species

The species can be divided into two major groups: (1) endemic to China; (2) not endemic to China. Among the first group, most are limited to SW China: *Arisaema jingdongense* which is endemic to the Wuliangshan Mountains; *Arisaema tengtsungense* is shared in Tengchong (W Yunnan) and Jingdong; *Arisaema inkiangense* and *Rhaphidophora luchunensis* are distributed in the area to the south of the Wuliangshan Mountains; *Arisaema wattii* occurs in Yunnan, Sichuan and Guizhou provinces in SW China. Only three species, *Acorus gramineus*, *Arisaema lobatum and Arisaema wardii* can reach north to the Huanghe River (Yellow River). In the second group, most are distributed in SW and S China and the north part of tropical Asia. Only *Arisaema erubescens* grows in most East Asia but not in Japan and *Arisaema griffithii* var. *verrucosum* reaches the E Himalayas. *Colocasia esculenta* var. *antiquorum* is distributed in SE and S Asia. Moreover, the only continental species, *Remusatia vivipara* shows the floristic relation between the Wuliangshan Mountains and the remote continent of Africa. All the distribution patterns of the aroid flora tell us that the flora of the Wuliangshan Mountains is basically subtropical in nature and has a close affinity to tropical regions especially to tropical Asia.

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